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DISTINCTIVE FEATURES IN THE PLURALIZATION RULES OF ENGLISH SPEAKERS.

BY- ANISFELD, MOSHE AND OTHERS

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FIRST AND SECOND GRADERS, GIVEN "CVC" SINGULAR NONSENSE WORDS (E.G., NAR) ORALLY AND ASKED TO CHOOSE BETWEEN TWO PLURALS (NARF-NARK), PREFERRED FINAL SOUNDS SHARING WITH /Z/ (THE MOST COMMON SHAPE OF THE PLURAL MORPHEME IN ENGLISH) THE STRIDENCY OR CONTINUANCE FEATURES. THIS SUGGESTS THAT THEIR PLURALIZATION RULES ARE FORMULATED IN TERMS OF DISTINCTIVE FEATURES RATHER THAN SOUND SEGMENTS. KINDERGARTEN CHILDREN AND ADULTS SHOWED NO SUCH PREFERENCES. THE SUBSTANCE OF THIS PAPER WAS GIVEN BY CO-AUTHOR JUDITH BARLOW AT THE ANNUAL CONVENTION OF THE EASTERN PSYCHOLOGICAL ASSOCIATION HELD IN BOSTON, MASSACHUSETTS, APRIL 6-8, 1967 AND BY MOSHE ANISFELD AT A PROJECT LITERACY CONFERENCE HELD IN CAMBRIDGE, MASSACHUSETTS, MAY 25-26, 1967. (SEE RELATED DOCUMENT AL 001 095.) (AUTHOR/DO)

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Distinctive Features in the Pluralization Rules of English Speakers

Moshe Anisfeld, Judith Barlow and Catherine M. Frail
Cornell University

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First and second graders, given CVC singulars (e.g., NAR) orally and asked to choose between two plurals (NARF-NARK), preferred final sounds sharing with /z/ the stridency or continuance features. This suggests that their pluralization rules are formulated in terms of distinctive features rather than sound segments. Kindergarten children and adults showed no such preferences.

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The sounds of a language constitute a system. They group themselves into categories and subcategories on the basis of their articulatory characteristics and their functions in the language. The division of sounds into vowels and consonants is widely recognized, but it is less well known that each of these major groupings must itself be subdivided. Further, not only classification of linguistic sound patterns but also cross-classification is required. For instance, the categorization of sounds in English into voiced and voiceless cuts across the vowel-consonant distinction. In certain respects, voiced consonants behave like vowels (all vowels being voiced) rather than like voiceless consonants. A case in point is the English pluralization rule which requires that singular nouns ending in voiced sounds, whether consonantal or vocalic, be pluralized by the addition of /z/ (e.g., sofas and dogs) and those ending in voiceless sounds by the addition of /s/ (e.g., docks).

A system of cross-classificatory categories, or distinctive features, originated by Jakobson (Jakobson, Halle, Fant, 1965) has been utilized by Chomsky and Halle (Chomsky, 1964; Halle, 1964; Chomsky and Halle, in press) and others within the generative transformational camp to develop formulations of phonological rules. In this system, every sound segment is classified as having a + or - sign value on every feature. A description of the values of a particular sound segment on all features uniquely characterizes that sound and differentiates it from every other sound in the language.

A feature description of /s/ and /z/, copied from Halle's (1964, p. 328) chart for the English consonants, can be found in Table 1.

Psychological support for the idea of features has been found in studies of perceptual sound confusion (e.g., Miller and Nicely, 1955), in memory experiments (Wickelgren, 1966), and in studies of sound substitutions of young children (Snow, 1964). Our intention is to extend the search for psychological validity of the feature analysis to the realm of linguistic rules. One possible method for conducting such investigations is exemplified in this preliminary study designed to investigate whether distinctive features are operative in the psychological functioning of English pluralization rules.

Consider the singular nouns ending in /l/, /n/, and /r/ to which /z/ must be suffixed for pluralization. One can formulate the pluralization rule by stating either that such singulars take a /z/ when converted into plurals or that they take a consonant characterized by the feature complex: +diffuse, -grave, +voiced, +continuant, -nasal, and +strident. Which of these two statements most closely approximates the representation of these rules in the minds of English speakers? In order to answer this question, children and adults were given, orally, synthetic nouns, and offered as plurals two forms, neither of which ended in the appropriate English marker /z/. They were asked to choose the "better" plural of the two. If the S's pluralization rules are formulated (implicitly, of course) on the sound segment level, then the choices should be randomly distributed, since both alternatives are non-/z/'s. However, on the feature level, some sounds are closer to /z/ than others, and these should be chosen more frequently.

Before we turn to the description of our experiment, an explanation of the choice of the distinctive feature system as our frame of reference is in order. All linguists employ some classification scheme for grouping sounds (e.g., Francis, 1958, the standard text for American English). For example, no linguist studying English phonology would leave out such categorical distinctions as vowels vs. consonants, stops vs. fricatives, and voiced sounds vs. voiceless sounds. Three characteristics, however, make the distinctive feature framework particularly

suitable for our research. First, it provides an explicit system for the cross-classification of every sound, thus allowing a comparison of the importance of each classificatory dimension in the rule under consideration. Second, whereas in other linguistic theories, the classificatory schemes are fitted onto sound segments (called phonemes) which maintain an autonomous status, in the distinctive feature framework, the sound segments are denied legitimate theoretical status. Chomsky and Halle view the sound segment as nothing more than the simultaneous presence of a bundle or complex of features. Features, unlike categories, do not actually classify sounds but rather serve as their components and give them their identity. Third, Chomsky and Halle systematically formulate phonological rules in terms of features. Their approach therefore clearly suggests that, given an appropriate psychological test, one should find that pluralization rules, as well as other morphological rules, are mentally formulated in terms of features. However, although this research is directly inspired by the approach of Chomsky and Halle, it is not designed to establish their feature system as against other schemes. Rather, we wish to test whether sound components of any kind are involved in the psychological formulation of morphological rules.

Method

Subjects

The Ss were 20 kindergarten pupils, 40 first graders, 40 second graders, and 28 university students with approximate mean ages of 6 yrs 3 mo, 7 yrs 2 mo, 8 yrs 5 mo, and 19 yrs, respectively.

Materials and Procedure

Each item consisted of: (a) a CVC trigram ending in /l/, /r/, or /n/ (e.g., ZUL) which was presented as a singular name, and (b) a pair of two plural alternatives, formed by adding one sound to the trigram (e.g., ZULCH and ZULV). All names constituted permissible sound sequences in English. Ss had to indicate which of the

two they preferred as a plural.

In the experiment with children, a list of 48 trigrams was used as singulars. Plurals were formed by adding one of the following sounds: /p/, /b/, /m/, /f/, /v/, /k/, /g/, /t/, /d/, /n/, and /ch/. Every plural ending was compared with every other, except /ch/, which was compared with only three others to balance the design. The 48 items were randomly divided into two lists of 24, half of the children in each grade being tested on each list. There were two random orders for each list, and each plural within an item appeared an equal number of times, for different Ss, as the first and second choice, to control for position preferences.

The children were shown a drawing of a single "new animal" and one of the singular names was given to it. They were then shown a picture of two or more animals identical with the single animal and asked which of a pair of plurals they preferred as a name for the second picture of more than one animal. The order of pictures was the same for all list orders. Presentation of all names was oral, and S had to pronounce both plural names before choosing the one he preferred. If pronunciation was incorrect, E repeated the word and S had to repeat it until either it was pronounced correctly or E decided S was unable to pronounce it. In the latter case, which was very rare, no response was recorded for that comparison. The number of incorrect pronunciations was considerably lower than the error rate usually found in articulation studies with young children (viz., Templin, 1957) because our Ss were given second and third chances to correct initial errors.

The adult study contained the same plural markers as were used with the children as well as /j/ (as in judge), /sh/, and /th/ (as in thing). All plural endings were compared with all others, except /ch/-/sh/, which was inadvertently omitted. The procedure was similar in all respects to that with the children except that no pictures were used.

Results

In analyzing plural choices, comparisons were made between the number of chosen consonants that have the same sign as /z/ (the appropriate plural in all these cases) on a given distinctive feature, and the number chosen that have the opposite sign, for each of the six features relevant to distinguishing one consonant from another. The results of this analysis are summarized in Table 1. It was found that +continuant (/f/ and /v/) and +strident (/f/, /v/, and /ch/)

Insert Table 1 about here

sounds were significantly preferred over -continuant and -strident ones by the first and second graders. The t values for continuance (1st grade = 2.41, 2nd grade = 2.31) are significant beyond the .05 level and for stridency (1st grade = 2.78, 2nd = 2.73) beyond the .01 level, using two-tailed tests. No significant preferences at all were found for the kindergarten Ss. The adults significantly preferred +nasal (unlike /z/) over -nasal sounds ($t = 5.00$, $p < .01$). An analysis of individual sounds indicated an adult preference for /v/ (chi sq. = 9.52, $p < .01$).

The above analyses tested the effects of specific features on Ss' choices. We were also interested in investigating whether the absolute distance of a sound from /z/, regardless of the specific features involved, is related to the plural choices. To carry out such an analysis, the sounds used were divided into those which differ from /z/ on one or two features ("close" sounds) and those which differ on four or five features ("distant" sounds). The close sounds included /f/, /v/, and /d/ for the children, and also /j/, /sh/, and /th/ for the adults. The distant sounds for all Ss were /g/, /k/, /m/, and /p/. Chi square tests were calculated to compare the number of choices of close sounds over distant sounds with the number of reverse choices. The chi square values for the four groups are: kindergarten = 1.89 (NS), 1st grade = 1.22 (NS), 2nd grade = 7.03 ($p < .01$), and adults = .48 (NS). In the second

grade, there were 140 choices for the close sounds against 99 for the distant ones. The differences for the other three groups were, of course, smaller.

Discussion

The first and second grade pupils were, as hypothesized, guided by the feature characteristics of the offered plurals. The failure to find significant preferences among the kindergarten pupils cannot be attributed to their lack of productive knowledge of the plural inflection in English. Anisfeld and Tucker (in press) have shown that six-year-old children are clearly able to form and to recognize the conventional plurals of synthetic words. The present result is most likely due to the small number of kindergarten Ss. There was a tendency among the young Ss, strongest in the kindergarten group, to choose the last of the two alternatives offered. (The ratios of number of second choices to first choices are: kindergarten = 2.6:1, 1st grade = 1.9:1, 2nd grade = 1.7:1, adults = .9:1.) This position bias tended to mask preferences for specific sounds, and seems to have particularly obscured the results in the kindergarten group where the number of Ss was smallest and the position effect largest.

The preference of adults for +nasal (unlike /z/) sounds as plurals may be attributable to the fact that irregular English nouns requiring a sound addition to form the plural usually end in /n/ (e.g., children) or /m/ (e.g., cherubim). Further, /m/ is a regular plural in Hebrew and /n/ a regular plural in German. We suspect that many of the Ss had some acquaintance with at least one of these languages. The preference for /v/ might well be explained by the frequent change of /f/ to /v/ in pluralization (e.g., shelf-shelves). It appears that the adults interpreted the task as involving a choice between two irregular forms, and selected the most appropriate irregular plural.

The children, however, are likely to have taken the task at face value and let themselves respond spontaneously without the intervention of rationality-consistency considerations. Also, for young children, regular singular-plural relationships may be more prominent than irregular ones (see, for example, Ervin, 1964). In any event, first and second grade children seem to have chosen their responses on the basis of similarity of the artificial plural marker to the regular one on the features stridency and continuance. Why should these features be more important for the concept of plurality than the features +diffuse, -grave, +voiced, and -nasal, which also characterize /z/? This question can be answered by noting that the features +continuant and +strident differentiate /z/ from more other consonants than do the other four features. In other words, knowing that a sound is +strident or that it is +continuant, one has fewer consonants to choose from than one would by knowing the sound was +diffuse, -grave, +voiced, or -nasal. Thus, the qualities of being +continuant and +strident most closely describe the sound /z/.

It may seem from the significant preference of the second graders for close sounds over distant sounds that the absolute distance, regardless of the particular feature involved, was also a factor in Ss' choices. However, since the only -strident and -continuant sound in the close category was /d/ and it contributed only 4 points (out of 41) to the difference between the two categories, it appears likely that the preference for the close sounds reflects the preference for +strident and +continuant sounds over -strident and -continuant sounds. This interpretation is strengthened by the finding of no significant difference between close and distant sounds for the first grade, where stridency and continuance did yield significant differences. It appears though that for the first graders the rejection of -strident and -continuant sounds in the distant category was not as strong as the rejection of such sounds which fall outside the distant category.

It must also be noted that in the present study there is a very high overlap between the +continuant and the +strident sounds. The only +strident and -continuant sound is /ch/, and it was compared with only three other sounds. Thus, it is not possible from the present results to say that both features were relevant in the Ss' preferences, but it appears that Ss significantly preferred sounds that are related to /z/ on stridency, since this dimension is the more inclusive and the more highly significant one.

The finding that voicing, of primary significance in perceptual confusions (Miller and Nicely, 1955), was not a significant factor here is also worth noting. It suggests that Ss' pluralization rules are not formulated in terms of the voiced /z/ and voiceless /s/ separately but rather in terms of the archisegment /s,z/ which is unspecified with respect to voicing. The presence or absence of voicing in the plural case is governed by a general rule applicable also to the past tense morpheme. The rules states that the inflectional suffix has the same sign (+ or -) on voicing as the sound preceding it. Because of its generality this rule is not properly part of the pluralization rule. This suggests that psychologically there is only one marker of plurality in English, not three as is usually stated formally (Francis, 1958; Halle, 1961).

On the basis of the above findings and considerations we hypothesize that the pluralization rules which guide English speakers in their production of plurals are as follows:

(a) Singular nouns are pluralized by the addition of a +diffuse, -grave, +continuant, -nasal, and +strident consonant. (These features describe the characteristics common to /s/ and /z/.)

(b) Singulars ending in sounds after which the plural marker, defined in (a), cannot be articulated (e.g., /sh/), have the vowel /ɨ/ (a notational abbreviation for a complex of features) suffixed before they undergo pluralization.

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Footnote

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Table 1

A Distinctive Feature Description of /s/ and /z/
and the Results for the Four Groups of Ss

Distinctive Features	Plural Segments /s/	Plural Segments /z/	KINDERGARTEN Mean preference for "like /z/" sound	KINDERGARTEN t	KINDERGARTEN p	FIRST GRADE Mean preference for "like /z/" sound	FIRST GRADE t	FIRST GRADE p	SECOND GRADE Mean preference for "like /z/" sound	SECOND GRADE t	SECOND GRADE p	ADULTS Mean preference for "like /z/" sound	ADULTS t	ADULTS p
Strident	+	+	.545	1.00	NS	.575	2.78	<.01	.571	2.73	<.01	.500	<1.00	NS
Continuant	+	+	.542	<1.00	NS	.569	2.41	<.05	.565	2.31	<.05	.502	<1.00	NS
Nasal	-	-	.536	<1.00	NS	.491	<1.00	NS	.511	< 1.00	NS	.670	5.00	<.01
Grave	-	-	.480	<1.00	NS	.470	<1.00	NS	.524	< 1.00	NS	.497	-1.09	NS
Diffuse	+	+	.531	<1.00	NS	.512	<1.00	NS	.498	< 1.00	NS	.555	1.63	NS
Voiced	-	+	.442	-1.07	NS	.460	-1.12	NS	.453	-1.57	NS	.536	<1.00	NS

Note--.Two features, vocalic and consonantal, are omitted from this table because only true consonants were used in this study and these features are irrelevant for distinguishing among them.